

ABSTRACT OF THE DISCLOSURE

A method for forming a trench capacitor. A semiconductor substrate with a trench is provided, and a trench capacitor is formed in the trench with a storage node and a node dielectric layer. The top portion of the trench is ion implanted to a predetermined angle to form an ion doped area on a sidewall of the top portion of the trench and a top surface of the trench capacitor. The ion doped area is oxidized to form an oxide layer. A sidewall semiconductor layer is formed on another sidewall using the oxide layer as a mask, and then the oxide layer is removed. A barrier layer is conformally formed on the surface of the trench, and the trench is filled with a conducting layer.